

Claims

- [c1] A method of forming a phase shift mask comprising:
patterning a non-transparent film on a transparent substrate to expose areas of said transparent substrate;
forming a mask on said non-transparent film to protect selected areas of said transparent substrate;
forming a phase shift oxide on exposed areas of said transparent substrate; and
removing said mask.
- [c2] The method in claim 1, wherein said process of forming said phase shift oxide comprises placing said transparent substrate and said non-transparent film within a deposition bath.
- [c3] The method in claim 1, wherein said process of forming said phase shift oxide is controlled to form a desired thickness of said phase shift oxide.
- [c4] The method in claim 1, wherein said process of forming said phase shift oxide is controlled to adjust the optical properties of said phase shift oxide.
- [c5] The method in claim 1, wherein said process of forming said mask forms openings in said mask above openings

within said non-transparent film to allow selected areas of transparent substrate where said phase shift oxide is to be formed to be exposed.

- [c6] The method in claim 1, wherein said non-transparent film comprises one of chrome, tungsten, molybdenum, molybdenum silicide, and a chrome film.
- [c7] The method in claim 1, wherein said transparent substrate comprises one of quartz, fluorinated quartz, CaF_2 , hafnium oxide, and a quartz substrate.
- [c8] A method of forming a phase shift mask comprising:
forming a non-transparent film on a transparent substrate; patterning an etch stop layer on said non-transparent film;
patterning said non-transparent film using said etch stop layer to expose areas of said transparent substrate;
forming a mask on said non-transparent film to protect selected areas of said transparent substrate;
forming a phase shift oxide on exposed areas of said transparent substrate;
removing said mask;
polishing said phase shift oxide down to said etch stop layer; and
removing said etch stop layer.

- [c9] The method in claim 8, wherein said process of forming said phase shift oxide comprises placing said transparent substrate and said non-transparent film within a deposition bath.
- [c10] The method in claim 8, wherein said polishing process controls the thickness of said phase shift oxide.
- [c11] The method in claim 8, wherein the thickness of said etch stop layer controls the thickness of said phase shift oxide.
- [c12] The method in claim 8, wherein said process of forming said phase shift oxide is controlled to adjust the optical properties of said phase shift oxide.
- [c13] The method in claim 8, wherein said process of patterning said etch stop layer comprises: forming an organic base layer on said non-transparent film; forming a nitride etch stop layer on said base layer; and forming a photoresist on said nitride etch stop layer.
- [c14] The method in claim 13, wherein said process of patterning said etch stop layer further comprises:
exposing said photoresist;
developing said photoresist; and
etching said nitride etch stop layer and said organic base layer through said the resist layer.

- [c15] The method in claim 8, wherein said process of forming said mask forms openings in said mask above openings within said non-transparent film to allow selected areas of transparent substrate where said phase shift oxide is to be formed to be exposed.
- [c16] The method in claim 8, wherein said non-transparent film comprises one of chrome, tungsten, molybdenum, molybdenum silicide, and a chrome film.
- [c17] The method in claim 8, wherein said transparent substrate comprises one of quartz, fluorinated quartz, CaF_2 , hafnium oxide, and a quartz substrate.
- [c18] A phase shift mask comprising:
a transparent substrate;
a patterned non-transparent film above said transparent substrate;
a liquid phase deposition oxide phase shift material within selected openings of said patterned non-transparent film.
- [c19] The method in claim 8, wherein said non-transparent film comprises one of chrome, tungsten, molybdenum, molybdenum silicide, and a chrome film.
- [c20] The method in claim 8, wherein said transparent sub-

strate comprises one of quartz, fluorinated quartz, CaF_2 , hafnium oxide, and a quartz substrate.